HEADQUARTERS
UNITED STATES ARMY MATERIEL COMMAND
WASHINGTON, D.C. 20315

AMC REGULATION
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LOGISTICS

AMC QUALITY ASSURANCE SYSTEM

1. Purpose. This regulation prescribes the U.S. Army Materiel Command (AMC) quality assurance system, identifies the elements thereof, and assigns authorities and responsibilities incident to operation of the system.

2. Scope. This regulation applies to Headquarters, AMC; AMC major subordinate commands (including subordinate installations and activities); project managers; and separate installations and activities reporting directly to Headquarters, AMC.

3. Definitions. For the purpose of this regulation the following definitions apply:

a. Quality. The composite of materiel attributes, including performance, configuration, logistics, and producibility factors, of an item of equipment.

b. Quality assurance. That function of management that comprises a planned and systematic pattern of all actions by which conformance of product to user requirements is predicted and designed in materiel during the development phase, and assured throughout the product's life cycle.

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*This regulation supersedes AMCR 700-6, 29 November 1962, including Change 1, 14 May 1963, and Change 2, 14 June 1963.

c. Quality assurance element. The organizational element of a major subordinate command or of a separate installation or activity that is charged with the responsibility for organizing, planning, developing, directing, coordinating, controlling, and assessing quality assurance operations for assigned materiel.

d. Inspection element. An organizational element within the AMC quality assurance system that is responsible for determining the conformance of supplies and services to prescribed quality requirements and which, with respect to contracts, has the responsibility for accepting or rejecting supplies or services offered for acceptance against the account of the Government.

4. General. a. The AMC quality assurance system extends and applies throughout the entire life cycle of any item of materiel. The system starts its operation during the AMC participation in the preparation of qualitative materiel requirements (QMR), Small development requirements (SDR), or other research and development project authority document; progresses through design, testing, production, use and reconditioning phases; and ends only when the item is dropped from the supply system. Inherent in the system is a requirement for independent evaluation of results obtained in product quality, and assessment of the adequacy and suitability of the product from an overall quality viewpoint. To the maximum extent practicable, the system is based upon specific and measurable qualitative requirements applicable to aach phase of the product life cycle.

b. The AMC quality assurance system encompasses those functions and operations that constitute a total quality concept. Among these are included the integratad control and assessment of product quality, reliability, maintainability, product testing, quality control in production and reconditioning operations, product inspection, calibration, and metrology. The system is designed to ancourage and secure the cooperation and integration of efforts in these fields, where and when required, in order to insure that coordinated quality assurance operations are applied to materiel.

c. Although the primary consideration in operation of the AMC quality assurance system must be directed toward obtaining product quality and reliability, the system emphasizes that only the proper degrea is necessary or desirable. Excessively high quality requirements (e.g., needlessly close tolarances) will defeat the system. Similarly, overly elaborate procedures and excessive inspection practices, or too frequent reviews of noncritical quality elements, will result in excessive cost. Consequently, the system is designed to function for the purpose of obtaining the proper degree of quality in materiel at reasonable cost.

d. Effective operation of the AMC quality assurance system requires collection and analysis of data appropriate to quality assurance assessment. These data must be collected and analyzed in an objective manner, must be pertinent to critical quality aspects, and will be the minimum necessary to

perform the quality assessment function. Data from existing reports and from reports serving other purposes will be used wherever practicable.

5. Objectives. The AMC quality assurance system has as its objectives:

a. The development of an integrated quality assurance program for all elements of AMC for the purpose of securing the required degree of quality in AMC materiel.

b. An operational quality system that clearly defines responsibilities and authorities for all activities contributing to quality assurance.

c. A system that obtains through cooperation and coordination the timely and constructive contribution of all elements of the system.

d. A system designed by intent to prevent product quality failures, to detect such failures that do occur at the earliest practicable date and prior to issue of materiel to troops, and the prompt correction of deficiencies once they are detected.

e. To provide the means within AMC for assuring the design, production, and delivery to the user of materiel based on requisite quality features.

f. To provide the means of measuring and assessing the status of quality assurance results within AMC, and to provide the basis of evaluation of such data to give direction toward improvement of quality assurance at a reasonable cost.

g. To provide a means of relating metrology and calibration matters to other aspects of quality assurance in order that they may receive proper attention and effort.

h. To foster the development of measurable qualitative quality assurance criteria for the use of all elements in quality assurance operations.

i. To provide a clear, understandable organizational structure for the AMC quality assurance program.

j. To prescribe for all elements of AMC those agencies to which requests for quality assurance advice, assistance, or service will be provided.

6. Organization for quality assurance. Appendix I provides a description of the quality assurance organization requirements, the relationship of the quality assurance activities with other organizational activities, and the basic responsibilities of these other activities for product quality.

7. Concept of operation. Total quality assurance to be obtained by the AMC quality assurance system is a continuous, sequential operation extending throughout the life cycle of materiel. Principal actions, in order of their time phasing, are:

a. Preparation of QMR's and SDR's. This is the initial step in the quality assurance system, and one of critical impact on all succeeding steps. Although QMR's and SDR's are the responsibility of the U.S. Army Combat Developments Command (USACDC) to prepare and approve, many elements of AMC have the opportunity to review and comment on these in draft form. Inclusion in these documents of realistic and complete quality data (including reliability, maintainability, and durability requirements) is absolutely essential. These data must be stated in as precise, measurable, and specific terms as knowledge and judgment will permit.

b. Development.

(1) If the project definition phase (PDP) is applicable, the opportunity should be used to refine and more clearly specify quality assurance requirements for the item. A complete quality assurance concept, including refined statements (quantitative to the extent possible) of quality, reliability, and maintainability requirements and the methods for achieving and demonstrating these requirements, will be developed during this phase. This concept will be included in the technical development plan (TDP). (When a PDP is not applicable, this quality assurance concept will be established early during development in preparing the TDP when required.)

(2) The development phase requires more participation by different AMC quality assurance activities than any other phase of the product life cycle. During this phase, design engineers must be cognizant of all product quality requirements and of the various quality assurance activities interested in and capable of assisting in meeting these requirements, and they must conduct their design efforts with these requirements and interests in mind. When designers need or should have technical assistance from QA activitie such assistance must be rendered in a timely manner. Quality must be designed into the product during development and not left for later incorporation through product improvement programs.

c. Engineering test/service test (ET/ST). Testing of developmental models following completion of design is essential to the success of the quality assurance system. This testing must be objective and realistic. Deficiencies in quality must be reported promptly and fully as soon as they are noted, in order that corrective action may be undertaken without delay.

d. Procurement and production. Production contracts must contain a clear statement of quality program and quality control requirements and the contractor must have been found capable of carrying out the requirements. During all aspects of production, product quality will be determined by Government inspectors and verified by whatever testing is specified. Of particular importance during this phase is a need for tight control of engineering change orders in order to insure that design quality is not downgraded or diluted through their use. Similarly, although contractor value engineering change proposals are to be encouraged, particular care must be exercised in the review of such proposals to avoid those that could result in the overall degradation of product quality.

e. Operational use.

(1) When the production item has been placed into the hands of troops the continuing process of maintenance of quality assurance begins. Repair specifications contained in technical manuals must be reviewed periodically to insure that quality of materiel is not adversely affected by loose or improper repair instructions. The equipment improvement report portion of the Army Equipment Reporting System (TAERS) provides a means of feedback on quality assurance matters. Modification work orders serve to put essential modifications on equipment. When serviceability of an item can be restored only through major overhaul, the equipment will be processed by depot shops or contract organizations against specifications containing appropriate quality assurance controls. These are AMC product quality functions that continue until the item is finally dropped from the supply system.

(2) For munitions, aircraft products, and general supplies placed in storage, a program for the evaluation of product quality must be established to periodically determine the condition of such materiel. The purpose of this program is to provide estimates of the effectiveness of materiel in storage; and when unsatisfactory conditions are disclosed, to provide a sound basis for corrective action.

8. Assignment of responsibilities. a. The Director of Quality Assurance, AMC, is responsible for the development of and staff supervision over the coordinated quality assurance system for AMC. Specifically, he is responsible for:

(1) Developing and promulgating AMC policies concerning total quality assurance to achieve an integrated control and assessment of product quality, starting with the draft QMR's and SDR's and continuing through the entire product life cycle.

(2) Prescribing and staff supervising the execution of a total quality assurance system for AMC, integrating metrology, calibration, reliability, product testing, quality control, and product inspection functions.

(3) Developing and controlling an integrated AMC system for product reliability assessment.

(4) Monitoring all AMC quality information feedback and utilization efforts, including the reporting and correction of incidents of unsatisfactory equipment.

(5) Developing policies for and staff supervising the operation of an Army calibration program responsive to research and development, procurement, supply, maintenance, and field operational requirements.

(6) Providing the chairman of the AMC Quality Managers Council.

b. The Director of Procurement and Production, AMC, is responsible for staff supervision over activities of the AMC quality assurance system within his assigned procurement and production mission area. Specifically, he is responsible for:

(1) Coordinating with design engineers and quality assurance personnel in advance production engineering work performed before type classification or release for production.

(2) Participation in specifying contractor quality program and quality control requirements, for evaluation of contractor capability to perform adequate quality control operations, and execution of contracts specifying quality assurance controls and performance.

(3) Verification of product quality through inspection and acceptance of materiel for the Government.

(4) Participating with the U.S. Army Test and Evaluation Command (USATECOM) and AMC commodity commands in such testing of production materiel as may be required.

c. The Director of Research and Development, AMC, is responsible for staff supervision over activities of the AMC quality assurance system which pertain to his mission area. Specifically, he is responsible for:

(1) Consolidation of AMC comments and recommendations on draft QMR's and SDR's to insure that adequate attention is given to quality aspects of the draft.

(2) Policy control and staff supervision over in-house and contractor design effort to insure incorporation of proper quality requirements in the design of new materiel.

(3) Assuring coordination between Government or contractor development personnel and activities in the quality assurance field during the design phase so that design effort is not jeopardized by untimely quality assurance assistance, and assistance when rendered is considered fully responsive by the design engineer.

(4) Insuring that type classification or release for production is not recommended for materiel that has critical quality deficiencies.

(5) Reviewing and evaluating the test programs and test results of the developing agencies and USATECOM.

(6) Continued engineering support for the life of the materiel.

(7) Insuring that engineering support is available on call to the national maintenance points and the national inventory control points concerned in the materiel, and assisting in assuring the adequacy of repair and reconditioning specifications in obtaining the proper quality of materiel for supply support.

(8) Reliability and maintainability engineering during the research and development phase.

d. The Director of Materiel Readiness, AMC, will participate in quality assurance matters that are of such significance that materiel readiness of the Army is affected.

e. The Director of Personnel and Training, AMC, will exercise staff supervision over the career development and training of AMC quality assurance personnel.

f. The Comptroller and Director of Programs, AMC, will provide financial resource guidance for the AMC quality assurance system and provide resources to the operating agencies of the system.

g. The Chief, Data Systems Office, Headquarters, AMC, will assist in the development of systems required for quality assurance evaluation.

h. Project managers established by the Commanding General, AMC, are responsible for implementing the AMC quality assurance system in accordance with the policies and objectives of this regulation and in the same manner as outlined for the commodity commanders. (See par. 4d, app. I.)

i. The Commanding General, U.S. Army Supply and Maintenance Command (USASMCOM), is responsible for staff supervision over activities of the AMC quality assurance system that pertain to his mission area. Specifically, he is responsible for:

(1) Quality assurance to be applied to the consumer phase of all military supplies, to include storage, distribution, and depot maintenance operations (in-house and contractual), as well as quality assurance for items procured locally by activities of USASMCOM.

(2) Operation of an effective inspection system within his subordinate installations which is responsive to the technical requirements furnished by the commodity commands.

(3) Establishing and maintaining effective procedures for the timely feedback of quality information on materiel in the depots and in the hands of the users.

(4) Participating with other activities of AMC to provide a thoroughly integrated and effective quality assurance program for the Army.

(5) Full utilization of the Army Equipment Record System to provide quality assurance advice and assistance to all elements of AMC.

(6) Through the USASMCOM worldwide customer liaison operation, obtaining and reporting items of quality assurance information to the appropriate AMC activities. Similarly, he will report to the Defense Supply Agency any quality assurance information that is actionable by that command.

(7) Providing a service to users through operation of area calibration laboratories and teams and petroleum laboratories.

(8) Accomplishing the functions set forth in c above as applicable to his assigned mission. (See par. 5f(5), AMCR 10-38.)

j. The commander of each major subordinate command except USATECOM is responsible for:

(1) Achieving required quality of assigned materiel.

(2) Operation of a quality assurance system for assigned materiel in accordance with appendix II and the policies and objectives of this regulation.

(3) Establishing and utilizing a quality assurance element at his command headquarters in accordance with appendix I, independent of development, engineering, procurement, production, and maintenance activities, to:

(a) Implement the quality assurance system throughout the command, including appropriate staff supervision of those activities.

(b) Improve quality assurance operations.

(c) Coordinate quality assurance operations with other commands and headquarters.

(d) Review and analyze product quality, including participation in the formal review point reviews (AR 705-5).

(4) Providing for appropriate quality assurance elements in accordance with appendix I independent of engineering, procurement, and production at subordinate commands, installations, and activities, and project manager elements as appropriate, that are under his jurisdiction, to accomplish the quality assurance program in proper relationship with other functional operations.

(5) Insuring that his national maintenance points and national inventory control points contribute to the quality assurance system in a timely manner.

(6) Utilizing technical representatives to examine into and report with recommendations on quality assurance matters pertaining to assigned materiel.

(7) Utilizing data from TAERS in improving quality of product.

(8) Fully utilizing laboratory facilities under his control to assist in quality assurance verification to the extent required.

k. The Commanding General, USATECOM, is responsible for:

(1) Operation of a quality assurance system for his assigned mission in accordance with appendix II and the policies and objectives of this regulation.

(2) Providing adequate test facilities to support the quality assurance system as required.

(3) Advising commodity commands and USASMCOM of results of tests conducted.

(4) Providing assistance in reviewing and standardizing specifications and quality assurance test plans and procedures.

(5) Advising the Director of Quality Assurance, AMC, of critical quality deficiencies encountered during tests performed at USATECOM installations.

l. The commanders of AMC procurement districts are responsible for the field execution of the contract administrative responsibilities noted in b above, pertaining to the Director of Procurement and Production, AMC. In addition, they are responsible for reviewing technical data packages for contracts placed in their districts for contract administration or inspection interchange to verify adequacy and clarity of quality assurance requirements. If quality assurance data is erroneous or incomplete, immediate contact will be made with the appropriate agency.

m. The Commanding General, U.S. Army Munitions Command, is responsible for operating an Army metrology and calibration center at Frankford Arsenal to fully support all AMC agencies in the metrology and calibration areas and provide such technical advice and assistance as may be requested on metrology and calibration matters as prescribed in AMCR 700-9.

n. The Director, Army Management Engineering Training Agency, Rock Island, Illinois, under the staff supervision of the Director of Personnel and Training, AMC, is responsible for the conduct of training of AMC quality assurance personnel in such courses as may be required from time to time.

o. Commanders or chiefs of laboratories reporting directly to Headquarters, AMC, are responsible for technical assistance and advice in their assigned areas of responsibility on quality assurance matters. They will participate in the development of quality assurance specifications as required.

p. Commanders of other installations and activities reporting directly to Headquarters AMC who have responsibility for development, engineering, and/or procurement (except for local procurement) will establish an appropriate quality assurance element to accomplish those quality assurance functions listed in this regulation that are appropriate to their assigned missions.

9. Quality assurance coordination. a. The AMC quality assurance system involves a large number of diverse operating agencies. Successful operation of the system is totally dependent upon the coordination of effort and cooperation among these agencies. Each must contribute not only to the system operation but to the improvement thereof.

b. It is important that an element be assigned overall responsibility for coordination in view of the number of participating activities

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in the quality assurance system. Since the quality assurance element is responsible for furnishing advice and assistance in quality assurance matters to the commander and staff, it is logical that primary responsibility for insuring necessary coordination in such matters be assigned to this element. This includes considerations such as reliability, maintainability, product testing, quality control, calibration, and metrology.

c. At appropriate levels within AMC the following coordination in the materiel cycle phases listed below must take place:

(1) QMR's. The draft QMR review must encompass the views of appropriate quality assurance activities. The quality assurance office (see par. 3a, app. I) will review the command comments on the draft QMR for completeness and adequacy of quality aspects before dispatch to higher headquarters.

(2) Project definition phase. Where this phase applies, quality assurance content must be carefully checked to assure that the results of the phase reflect the best quality assurance thinking for application to possible future development. The quality assurance element should review the reports resulting from this phase to assure completeness and adequacy of quality assurance coverage.

(3) Design phase.

(a) At the beginning of the development cycle the research and development element must include a quality assurance plan as part of its development and design plan. This plan will be reviewed by the quality assurance element to check for inclusion of assistance from proper quality assurance elements and the time phasing of such assistance. The quality assurance office will advise the research and development office of any modifications in the quality assurance plan considered advisable.

(b) Quality assurance activities and research and development management and design activities will execute the quality assurance plan during the development phase.

(c) At "in-process reviews" (IPR's) (AMCR 70-5) all quality assurance activities contributing to the design effort will be represented to verify the status of their areas of concern. The quality assurance office will check the overall status of quality assurance feed-in and its incorporation in the development work to date. Quality assurance matters will be discussed at IPR's to the extent necessary, and differences of opinion resolved. If a command decision is required, the problem will be presented promptly to the appropriate level. It is important that all AMC in-house quality assurance problems be resolved before the formal IPR. (See par. 7b(4) AMCR 70-5.) These in-house matters should be finally resolved no later than at the AMC conference held by the chairman before the formal IPR. The quality assurance element will also insure that the development test plan developed ith USATECOM includes appropriate quality assurance aspects. Test resulta

will be reviewed by appropriate quality assuranee activities as well as by the quality assurance office. The quality assurance office will verify with the research and development activity that quality assurance deficiencies are being corrected through design effort and that any assistance required of quality assurance activities is available.

(4) Procurement and production phase.

(a) On completion of the technical data package prepared before initiation of procurement, the package will be reviewed by quality assurance elements at the developing command for completeness and clarity and for verification that the technical data package accurately represents the item approved for release to production. If a district is to be involved in the procurement action a review for completeness and clarity will be made by district inspection elements upon receipt of the package at the district, before contract placement.

(b) The quality assurance portion of the preaward survey of prospective contractors will normally be conducted by procurement district personnel. Any advice or assistance neeessary from command quality assurance activities (particularly key inspectors) in connection with this preaward survey is to be requested without delay. If any questions exist as to the adequacy of the contractor's quality control program or capabilities, such commodity command assistance must be obtained and the problem solved before contract execution.

(c) During the production phase close coordination between the procurement district and the commodity command key inspectors must be maintained. Free exchange of quality assurance information is encouraged, and appropriate visits to plant sites by key inspectors are encouraged. Critaria for mandatory key inspector visits will be established by each commodity command.

(d) Production items scheduled for product testing will be approved by the procurement district inspection activity before undergoing tests. Results of product testing must be reviewed by the procurement district inspection activity. Any action necessary to correct product deficiencies must be promptly initiated by the procurement district with the commodity command concerned with the contract, with the contractor, or with both.

(e) Except as authorized by the commodity command, the procurement district will permit no waivers in performance against specifications. Contractor proposals for deviations must be carefully checked by the appropriate design agency before approval for deviation is granted.

(f) Particular attention must be paid to Requests for Technical Action and Requests for Waiver inasmuch as these changes can easily and inadvertently degrade the quality designed into the development item. Inspection personnel in the procurement district and quality assurance personnel of the commodity command concerned must be particularly aware of the possible impact of production changes on product quality.

(5) Operation phase.

(a) Commodity commands, through their technical representative program, will closely observe early product performance. Quality assurance elements, in coordination with national maintenance points, will review technical representatives' reports to keep abreast of product quality matters resulting from field operation.

(b) As part of TAERS, using units submit Equipment Improvement Reports (EIR's) on materiel in use. Commodity command quality assurance activities must keep informed of EIR's submitted on assigned materiel and insure that prompt corrective action is taken where appropriate. Quality assurance elements will also review the quarterly EIR Digest prepared by their commodity command. A review of the quarterly digest prepared by other commodity commands will also be of value, since these digests contain information which can be of assistance in preventive use in new development materiel and for product improvement in older materiel. Coordination among commodity command quality assurance elements to this end is encouraged.

(c) Equipment Readiness Reports, also published quarterly by the USASMCOM Logistics Data Center, contain valuable quality assurance information. Where complex systems are reported upon, quality assurance coordination between commands is necessary.

(d) Stockpile surveillance of materiel involves a constant exchange of quality assurance information between field, depot, and commodity command quality assurance activities. Exchange of data and visits is encouraged so that full knowledge of the quality of materiel in the stockpile is available at the proper echelons at all times.

(e) During the operational phase, modifications of equipment are sometimes necessary for valid reasons. Quality assurance activities will review proposed modifications on an assist basis before issuance of modification work orders. Past experience indicates that, unless there is close coordination of modifications, a change designed to correct one deficiency can inadvertently cause degradation of quality and result in more serious ills.

(6) Depot maintenance phase.

(a) During the design phase reconditioning standards will be developed as part of the design effort. These standards must be maintained in a current status at all times and should reflect changes required derived from quality assurance and maintenance data obtained during the operational phase. Coordination between quality assurance activities, particularly national maintenance points, key inspectors, and design activities, is essential for the updating of these standards.

(b) Commodity command key inspectors and other quality personnel will provide for scheduled reviews and close contact with depots engaged in the reconditioning and storage of their assigned materiel. Exchange between commodity commands and depots is necessary for the preparation of

adequate quality assurance plans for the reconditioning of materiel, and for the actual shop execution of these plans.

10. Quality assurance assessment. a. Assessment of product quality in development and production phases.

(1) The QMR establishes the development phase quality goal. Assessment of progress to meet this goal must take place during the entire development phase and most particularly at the in-process review points. Type classification of the item fixes the inherent design quality of the item.

(2) Government requirements for quality assurance of the production item are fixed by the technical data package. Quality assurance assessment through review of these documents must be performed. Also, assessment of the contractor's capability to meet these quality assurance requirements is made through surveys of contractor's programs and facilities and Government quality evaluation laboratories. Operation of the procurement district's inspection activities verifies performance of the contractor against the Government quality assurance requirements. Independent assessment through product testing of materiel before issue to troops is performed by appropriate agencies, particularly USATECOM.

(3) Assessment must be realistic and objective, and must be based upon factual data. If evaluation and assessment indicate deficiencies, early action is mandatory to prevent degradation of product quality.

b. Assessment of product quality in operational use.

(1) Data necessary for assessment of quality aspects of performance of materiel in the hands of troops is obtained from the TAERS (e.g., parts consumption, maintenance efforts, EIR's and Hi-5 information), technical representative's reports, liaison with users, stockpile surveillance reports, stockpile laboratory and firing program reports, and other sources. Assessment of the quality of materiel in the hands of troops is a continuing responsibility of all quality assurance elements.

(2) When depot reconditioning of materiel is contemplated, a careful quality assurance assessment of the program will be made. Application of the reconditioning standards to materiel should receive testing and evaluation by USATECOM to ascertain the amount of serviceable life and reliability restored to the reconditioned materiel. Changes to work specifications and quality assurance controls will be applied as necessary to obtain the proper degree of serviceability. For optimum results, cost and other factors must be considered in revising the recondition- Results can then be made known to materiel readiness activities units of the quality and expected performance of the recondition

c. Assessment of product quality will include the use c information shown above as well as other intermittent sources of

The latter includes inspector general reports, General Accounting Office and Army Audit Agency audit reports, information gained through staff or technical visits to the field, industry recommendations, and data incidentally gained through normal correspondence. Quality assurance action will be taken based upon evaluation and assessment of all data available, if indicated.

d. The operation of the AMC quality assurance system calls for assessment of the effectiveness of the system. Recommendations for improvement of the system from any AMC element are urged and are considered necessary for the existence of a viable system. Such recommendations should be submitted at any time, by any quality assurance element when its evaluation or assessment of the system shows the need for change.

11. Quality assurance system. a. Appendix II prescribes basic uniform quality assurance operations for all elements of AMC. Where local organizational structures require the placing of certain quality assurance functions in an organizational element different than that noted due to the physical separation of facilities, or where responsibilities for certain phases of the life cycle are not assigned, the intent of this regulation will be followed.

b. Each major subordinate command will prepare and publish its own implementing quality assurance regulations in compliance with this regulation. This system will be kept current to reflect the system in operation. Copies of the implementing instructions and revisions thereto will be furnished to the Director of Quality Assurance, AMC.

c. The quality assurance system regulations will be specific in assignment of responsibility for quality assurance and these assignmenta will clearly identify that quality assurance element within the command structure responsible for coordination of quality assurance matters with AMC elementa outside of the command.

12. Program and budget aspects of quality assurance. a. Contract execution and administration, key inspection, and calibration activities requirements will be programed and budgeted within specifically designated programs. With the exceptions above, the programing and budgeting of quality assurance requirements will be accomplished within the existing program and budget structure as a part of the specific program covering the specific product phase in which the quality assurance operation occurs and benefits. For example, programing and budgeting for reliability engineering will be included in the appropriate Research, Development, Test and Evaluation project and quality control engineering for production will be included in PEMA.

b. Each quality assurance activity of AMC is responsible for stating its total quality assurance resource requirements to its program and budget source; developing a balanced quality assurance program; and recommending apportionment of resource requirements to the various budget programs as appropriate.

c. Each quality assurance element, as a part of its system assessment activities, will review the results obtained from the use of available

resources and, as necessary, make adjustments within assigned authority and make recommendations for required adjustments of other activities to obtain a balanced quality assurance effort.

13. References. a. AR's 705-10, 705-25, 705-26, 715-20, 750-20, and 750-25.

b. AMCR's 10-38, 70-3, 70-7, 70-10, 70-11, 310-6, 700-9, 700-15, 700-17, 715-55, 715-60, 715-508, 715-509, 742-1, and 742-2.

Appendix I

ORGANIZATION FOR QUALITY ASSURANCE

1. Purpose. This appendix sets forth concepts and requirements for the management of quality assurance programs at the major subordinate commands and their subordinate elements.

2. Concept. a. The quality of AMC materiel furnished to the user is the result of an AMC-wide effort and is not the sole responsibility of any single organizational element. Ultimately, the quality of product depends on the competence and integrity of design, effectiveness of manufacturing operations, diligence of support operations, and pride of workmanship of each individual. Thus, it is of critical importance that any quality assurance program be based on a solid foundation of clear assignments of responsibility for quality to management and to each operating element contributing to quality.

b. To maintain an effective quality program for AMC materiel, each AMC element must consider quality consciousness for any given item as a permanent responsibility. Although the product progresses through three general phases of research and development, procurement and production, and support operations, this does not mean that quality responsibility shifts correspondingly. It can be considered that only a shift of emphasis of quality assurance effort occurs from phase to phase. In order to accomplish the phased actions of the quality program in proper sequence, all elements must continuously provide services and quality support as required, and must retain their interest in assuring required product quality for the entire life of the item.

c. Determination of product quality must be based upon true nbjectiveness. The development, conduct, and evaluation of inspections and tests for the purpose of approving or accepting products from development, production, depot maintenance, or storage must be performed by an organizational element or agency other than that directly responsible for design, production, maintenance, or storage of the product.

d. The quality assurance segments at the major subordinate commands and their subordinate elements act in a dual role. (See fig. 1.) This dual role involves performing both a service for the product or other functionally oriented segments of the organization and acting as an independent check and balance to assure the required quality of all assigned products throughout the entire life cycle. The first aspect covers performing services such as assisting in developing the quality portion of the technical development plan, providing experience data on item performance, assisting in planning tests, preliminary and final development of inspection equipment designs, etc. The second aspect is one of providing staff supervision of the quality assurance program for the commander of the activity to

assure him of the existence of a complete quality assurance system; provide required policies, procedures, and techniques for quality assurance; perform periodic review of quality assurance system operations to assure conformance with established requirements; and conduct independent assessments of the product quality throughout the product life cycle. By acting as an independent evaluator of the product quality, this staff activity must assure that the pressure of development schedules, production schedules, cost effectiveness studies, etc., do not jeopardize the required quality of designs, quality of product, or maintenance of product quality in storage.

3. Quality assurance organization. a. The quality assurance element at the major subordinate commands (except USATECOM) will be established separately, independently, and with a direct reporting relationship to the commander.

b. The quality assurance activity at subordinate elements of the major subordinate commands will be independent of development, engineering, procurement and production, and maintenance activities and will report directly to the commander.

c. Major subordinate commands and installations and activities reporting to a major subordinate command will establish integrated quality assurance organizations as indicated in b above. Major subordinate commands that desire temporary exemption from this requirement will obtain approval from the Director of Quality Assurance, AMC, on a case-by-case basis, and will concurrently submit a plan that will provide for a long-range objective of an integrated quality assurance organization.

4. Quality assurance organization functions. a. The quality assurance element of the major subordinate commands will, as a minimum, be assigned the following functions:

(1) Establishing and implementing a total quality assurance system for assigned materiel in accordance with this regulation.

(2) Representing the command on quality assurance matters with other AMC elements; Headquarters, AMC; other departments; and industry.

(3) Conducting periodic assessments of the command's quality assurance operations to assure the adequate and timely application of each element of the system.

(4) Conducting independent assessments of product quality throughout the entire product life cycle.

(5) Maintaining a sustained effort to improve the quality assurance system for application to assigned products.

(6) Performing quality assurance operations for project managers and other elements of AMC as required.

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(7) Coordinating quality assurance operations when two or more support activities are responsible for portions of the total quality assurance system.

b. The quality assurance element of elements subordinate to a major subordinate command will be responsible for:

(1) Those specific quality assurance operations described in this regulation that are associated with the basic missions assigned.

(2) An independent assessment of the product quality during that portion of the assigned product life cycle.

(3) Periodically assessing the performance of the quality assurance system and participating in total quality assurance systems review for assigned products.

(4) Serving as a contact point for all matters concerning quality assurance for assigned products.

(5) Performing quality assurance operations for project managers and other elements of AMC as required.

c. The quality assurance element of USASMCOM will, as a minimum, be assigned the functions outlined in a above, for designated DSA-managed items assigned to USASMCOM.

d. The quality assurance element of a project manager's staff will be responsible for the management of the quality assurance program for assigned products and for the performance of the quality assurance operations in accordance with the intent of paragraph 3 of this appendix. Project managers will make maximum use of the services provided by the quality assurance organization of a major subordinate command or its supporting installations and activities to supplement his internal quality assurance capabilities, as necessary.

e. The quality assurance element of USATECOM will, as a minimum, be assigned the following functions:

(1) Establishing and implementing a quality assurance program in compliance with this regulation.

(2) Representing the command on test and evaluation quality assurance matters with other AMC activities and departments.

(3) Reviewing the results of tests performed at USATECOM installations in order to report critical quality deficiencies to the Director of Quality Assurance, AMC.

(4) Providing representation at formal and special IPR meetings.

DUAL FUNCTIONS — MAJOR SUBORDINATE COMMANDS

Operations (see app. II)	Quality assurance element		Inspection element
	Evaluation	Services	Services
1. Reliability Engineering (R0 - R3)		X	
2. Assessments (A1 - A10, A20, A21)	X		
3. Information Feedback and Analysis		X	X
4. Testing			
(T2) (T4) (T5)	X		
(T1)		X	
(T3) (T6)	X	X	
5. Quality Control			
(QCE1 - QCE4)		X	
(QCA1, QCA2, QCA4, QCA6)		X	
(QCA3) (QCA5)			X
6. Stockpile Reliability			
(S1)		X	
(S3)	X		
7. Calibration (M0 - M8)		X	
8. Breakout and Repair Parts Procurement			
(B1)		X	
(B2)		X	
9. Technical Data Quality Control		X	X
10. Depot Maintenance Quality Control		X	
11. Maintainability Engineering (A0 - A5)		X	

Figure 1

Appendix II

TOTAL QUALITY ASSURANCE OPERATIONS

1. Purpose. This appendix establishes the basic operations of the total quality assurance system and prescribes the time frame, basic policies, and source of funds for each operation.

2. General. a. The operations covered in paragraph 3 comprise the basic common elements of a total quality assurance system and are applicable to all products. The specific application of any one operation depends on the particular stage of the product life cycle. The system is completely applicable to a new product entering into the development cycle, whereas an item currently in production would employ only those operations applicable to procurement and support operations. Each command must determine which quality operations are applicable to its materiel and the proper phasing of these operations.

b. Funds to support each operation will be programed from RDT&E, PEMA, or O&M,A sources as currently authorized in appropriate regulations. General sources of funds to support specific portions of each operation are indicated in appendix III.

c. Each command will develop a systematic means of planning the total quality assurance program and will establish and maintain a plan for each major product. For new materiel this plan will be initiated as soon as possible after the receipt of the QMR's and will provide for the applicability of each operation, the schedule for implementation, level of effort, and responsibility for accomplishing each operation. For those materiel projects currently in process, or where certain phases are accomplished by other than AMC activities, the plan will cover appropriate operations associated with the current status, limited to AMC assigned

responsibilities. Where specific operations are not performed, the plan will include the reasons for such deletions. This plan will be periodically reviewed and updated to cover significant additions and changes.

3. Quality assurance operations. The basic operations of the total quality assurance system are described below. Each major quality assurance operation has been given a descriptive title (e.g., Reliability Engineering), and the component operations thereof have a number identification (e.g., R2). Quick visualization of the time sequence of operations, phase in the life cycle involved, general funding source, and relationship to similar quality operations can be obtained by reference to the charts in appendix III. For clarity in comprehending the total system, appendix II should be read with appendix III available for ready reference.

a. Reliability engineering operations.

RO (1) Reliability improvement. Reliability engineering to be effective must maintain capability in the reliability technology as it applies to the commodities assigned. This is accomplished by a sustaining effort involving identification of failure causes and the application of these lessons to future operations; identification of components requiring further development to improve reliability; establishing component experience files to assist in future part selections; reviewing new techniques of other activities for possible use; and developing other techniques that may be used for future projects. Assistance is furnished to engineering, USACDC, and other customers in establishing reliability requirements and developing methods for test demonstrations of reliability.

R1 (2) QMR/SDR reliability improvement. During this phase of reliability engineering, the QMR or SDR drafts ars reviewed to provide for realistic reliability requirsment statements which are compatible with all the other stated product characterisitcs. Reliability requirements must be obtainable and capable of being demonstrated by reasonable tests. Reliability statements should be stated in quantitative terms with a level of confidence whenever possible. A general statement on methods of testing with controlled conditions should be included at this time. (See AR 705-25.)

R2 (3) Detail reliability requirements. As soon as possible after receipt of the approved project, the reliability engineering effort provides for refining the general requirements for reliability and quality in the QMR's into technical requirements that can be used in development contracts or Government laboratories. These statements are a part of the technical characteristics describing the project. Requirements for reliability and

quality are prepared for contracts for the Project Definition Phase or if the PDP is not applicable, for development contracts. This effort includes developing specific quantitative reliability requirements for the system and subsystems, as necessary; preparing detail scopes of work for reliability, where required; selecting specific specifications for inclusion; and specifying test plans required to demonstrate achieved reliability. This operation also includes the preparation of the appropriate parts of the TDP covering reliability and quality operations, and the establishment of the project quality assurance schedule covering major activities in quality assurance, assigning responsibility, and setting forth a schedule for their accomplishment.

R3 (4) Project reliability engineering.

(a) Reliability effort during this phase of development requires reliability engineering participation with development engineering to provide for:

1 Reliability design analysis to apportion reliability goals to subsystems and components, and to determine system, subsystems and component failure modes.

2 Establishing a reliability test plan to demonstrate reliability achievement. This plan should be developed as a part of the overall test plan to assure maximum utilization of all tests. This plan will cover subsystem and component testing as well as system demonstration.

3 Developing the detail environmental envelope, to include induced environments as well as natural conditions based on the QMR requirements.

4 Preparing necessary documentation to support the reliability program, such as contract provisions, additional statements of scope of work, specifications, standards, and reports.

5 Assisting in selection of the contractor, and continuous monitoring of contractor efforts to determine adequacy of his reliability efforts. Provide for a system of controlling subcontractor and vendor activities concerning reliability.

6 Establishing a program for the qualification and application of parts to be used in the system.

7 A data information system designed to provide reliability data from tests, production environment, user sites, etc. to system design activities for their use in evaluating design.

8 An educational program directed toward the specific project personnel to provide for the individual understanding of reliability requirements and their contributions to reliability.

(b) Reliability engineering also supports the development engineer during this phase as follows:

1 Participating in design and conduct of experiments or tests and providing data analysis assistance.

2 Providing special instructions concerning inspection and quality control requirements for prototype production.

3 Assisting in review of technical documentation to assure that data are complete and meet other contractual requirements.

4 Preparing necessary guides and checklists for engineering activities to assure proper consideration of reliability as a part of this effort.

b. Assessment operations.

(1) General. Quality assessments are considered one of the essential points reviewed at the formal in-process review (IPR) meetings and will be presented by a quality assurance representative.

(2) System assessment. System assessment will consider, as a minimum, the following factors at the appropriate assessment points:

(a) Conformance of product quality with design intent.

(b) Conformance of the product with reliability, maintainability, and safety requirements. (See AMCR 385-12.)

(c) Adequacy of technical data, including test and inspection data, for production and inspection purposes.

(d) Adequacy of inspection and testing equipment and procedures to assure required quality and safety.

(e) Adequacy of on-site inspection and testing operations.

(f) Adequacy of testing to insure fulfillment of special requirements such as endurance, safety, or interchangeability.

(g) Necessity for additional testing whenever new and novel production techniques are involved, unproven commercial or proprietary items are utilized, additional quality engineering data are required, or special safety and reliability requirements exist; or when deviation requests affecting any of the above factors are under consideration.

(h) Assurance that previously reported deficiencies and shortcomings have been corrected.

(Note: When the continuing command review of product program progress indicates a major quality problem, special reviews will be established by the commodity command or project manager for the purpose of establishing a detailed written plan of coordinated action to resolve the problem area. Top management of the commodity command and its subordinate installations will participate in this review together with qualified representatives from engineering, procurement, maintenance, quality assurance, USATECOM, agencies assigned subsystem responsibilities, and other interested elements of the command as appropriate.)

(3) Assessment points.

A1 (a) Technical characteristic review.

A2 (b) Engineering concept review.

A3 (c) Design characteristic review.

A4 (d) Prototype system review.

A5 (e) Service test review.

(Note: Assessment points A1 - A5 correspond in time to the in-process review points specified in AMCR 70-5. However, these assessments are an AMC review and do not involve other agencies not a part of AMC listed in referenced regulations. Product quality assessment will include analysis of what is actually known about performance capabilities of the product and its components and an assumptive type analysis based on engineering design and estimation models. Assessment of the quality

assurance operations will determine the adequacy of the plan and a review of other elements contributing to product quality such as maintenance, human factors, safety, producibility, and reliability technologies to assure that they have been given adequate and timely consideration.)

A6 (f) Initial production of product.

A7 (g) Initial production from each new production source and/or during production whenever substantial changes have been made in design. (This point will usually coincide with a comparison test to provide data for evaluation.)

A9 (h) Major modification work orders (not previously covered by substantial change in production) and initial rebuild or retrofit of product.

A10 (i) Major modification work orders (not previously covered by substantial change in production) and initial rebuild or retrofit of product at new sources and/or during these operations whenever substantial changes have been made in design. (These points will usually coincide with a comparison test to provide data for evaluation.)

(4) Product assessment.

A20 (a) In addition to the specified assessment points listed above, the quality assurance element will provide a running and progressive assessment of product quality. During the early phase of product development the assessment will generally be estimates based on reliability and engineering analysis of component designs and early test results. As the program progresses, test and use data from the test program and information feedback system will provide a basis for assessing and predicting product quality.

(5) USATECOM.

A21 (a) The testing operations of the quality assurance system require the submission of the product to USATECOM where the results of ET/ST indicate. Additionally, samples of the product from production and from depot maintenance are also required for initial production tests. Results from these tests will be expeditiously furnished the commands and other activities interested in the operation. In addition, USATECOM will analyze these data by comparing tests to original engineering test results to record

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serious quality deficiencies. In addition to furnishing reports of these deficiencies for each test, USATECOM will periodically provide to the commodity command responsible for the materiel and Headquarters, AMC, a summary report of all quality deficiencies that exist and have not been corrected in subsequent tests.

c. Product quality information feedback and analysis operations.

Quality Information Operation

(1) A quality information feedback and analysis operation is required to provide for the organized collection, analysis, and dissemination of quality information; to assure that appropriate activities such as engineering, procurement, maintenance, and quality assurance are furnished product quality information required for their function; that available data are fully utilized and additional data requirements are carefully monitored; and that appropriate action is taken to correct any deficiencies revealed by such data together with action to prevent recurrences of these deficiencies. The specific system or systems used for collection, storage, analysis, and reporting techniques will depend on the specific commodities involved, number of agencies and their location, amount of data required, etc. Each command is required to develop an appropriate system for its needs, making maximum use of existing data, providing for constant review of the system to eliminate unnecessary requirements and assure that system costs are warranted based on benefits derived from the system. Additionally, USATECOM will support the quality information feedback systems established by other major subordinate commands. Other quality information feedback is provided in part from TAERS (TM 38-750), DA equipment readiness reports, information from the technical representative program, inspector general reports, depots, stockpile condition code reports, and other sources. Use of existing reports is encouraged.

d. Quality assurance testing operations.

(1) General.

(a) Testing operations described in this element are limited to those tests of primary concern to quality assurance operations and are not intended to cover all testing that will be conducted. However, it is the responsibility of the quality assurance elements to plan their testing programs in coordination with engineering, maintenance, and producers in order to gain maximum benefits from all tests being performed. Advance planning should provide for integrated testing to satisfy the technical requirements of engineering, quality assurance, and the produeer without duplication.

(b) A basic objective of quality assurance testing is to assure the product continues to meet the established user standards such as the QMR's (SDR's) or the final type-classified items and to detect any condition that degrades product quality. To achieve this objective, quality assurance testing should be planned to utilize the knowledge and skills of USATECOM on a progressive basis. This can be accomplished by establishing the test plan in cooperation with USATECOM and requiring the utilization of the facilities and personnel performing the engineering tests to also perform the later production and depot maintenance testing. It is essential that the standards used periodically to check production or rebuild products be essentially the same as the engineering test standard so that comparative, quantitative data are produced.

(c) Quality assurance activities must maintain a constant surveillance over their testing programs to assure that the latest and best techniques are utilized and that testing programs are coordinated to minimize the total amount of testing without jeopardizing test objectives. Provisions should be included in test planning for adjusting the amount of testing based on results of previous tests. The amount of testing may be reduced whenever there is sufficient evidence of control of quality.

(d) The quality assurance test plan will be prepared as a part of the overall quality assurance plan and will be updated as required. The tests covered by this plan will be appropriately planned and included as a part of the integrated test plan whenever an integrated plan is required.

(2) Reliability testing.

(a) Reliability testing of the product during the development phase is required to provide maximum amount of reliability information early in the development the program. The basic objectives of reliability are to:

1 Evaluate the reliability of the product and its subsystems and components.

2 Identify failure modes, effects, and frequencies under the natural and induced environmental stresses applicable to the product and to eliminate such failure modes before the final system testing.

3 Reduce the risk of failures and reliability problems in the engineer and service tests.

4 Establish and verify the reliability attained by components, subsystems, and sytems during the development phase and to provide a standard for subsequent evaluations of product from production.

5 Provide for the qualification testing of components and subsystems to assure their reliability and to provide criteria for future evaluation of these components during production and breakout procurement.

(b) For the purpose of this regulation, the criteria above are applicable to maintainability engineering in establishing and improving maintainability requirements.

T2 (3) Production testing.

(a) Production tests are required to assure that the product from production meets the user quality requirements and is at least as good as the quality standard expressed by the QMR or the type-classified item. Such tests primarily serve to prevent production of unsatisfactory prooucts. A production testing sequence is required for each producer and will usually be repeated for a producer whenever there is a lengthy delay or interruption of production, or where major changes (engineering change orders) during production are effected. The frequency and extent of production testing will depend on the following criteria:

1 Critical safety or reliability characteristics exist.

2 Report that quality deficiencies exist.

3 Inadequate quality reported in previous production.

4 Current data not adequate to evaluate performance on life requirements.

5 New production techniques or commercial or proprietary components, which have not been adequately tested or proved out are involved in production.

(b) Preproduction test.

1 An engineering type test, conducted by or under the supervision of the responsible procuring agency in coordination with the developing

agency, of a preproduction model, produced in accordance with the supply procurement specifications and drawings using the same methods, materials, and equipment as will be used during regular production, in order to verify production drawings, processes, and materials.

2 This test will normally be more severe than mere specification acceptance testing in order to assure compliance with user requirements and to detect any quality deficiencies.

(c) Initial production test.

1 A test, conducted by or under the supervision of the responsible procuring agency in coordination with the developing agency, of an early item or system from the first production run. This test is for the purpose of verifying the adequacy and quality of materiel when manufactured according to the production drawings and the mass production processes.

2 Products in this test will be considered for subsequent use for the preparation of rebuild specifications.

(d) Comparison test.

1 A comparison test is a test of random samples of production line items, conducted as a quality assurance measure, to detect any design, manufacturing, or inspection deficiencies that may reduce the effective operation of the item by the using agency.

2 Comparison testing is conducted by an agent independent of the producer or Government on-site inspector.

T3 (4) Surveillance test.

(a) A test of materiel to determine the extent of deterioration as compared with original requirements.

(b) Surveillance testing includes stockpile tests which are special tests for the purpose of evaluating the quality of materiel in stockpile. These tests are most applicable to the class of materiel for which operating times are short, functioning is one-shot and nonrepeatable, and storage period covers many years. Ammunition, special weapons, missiles, and

rocket motors are typical examples of products in this class. Technical provisions for these tests are developed as a part of the stockpile reliability provisions described under the stockpile program. Similar testing programs will be developed for assigned aircraft items, general supplies, components, and end items, to determine the extent of deterioration and to establish appropriate deterioration limits. Known short shelf-life items, such as batteries, require individual testing programs.

T4 (5) Depot reconditioning test.

(a) A test of a standard item which has been reconditioned, renovated, rebuilt, or overhauled, to determine the quality level of the reconditioning process, and to verify the degree to which the item meets serviceability standards.

(b) These tests are primarily performed to prevent production of unsatisfactory reconditioned products. These tests will be conducted preferably by USATECOM proving grounds in prescribed sequence for each contractor or Government maintenance operation for a specific product. The criteria to be considered for these tests and sequence of tests are essentially the same as production tests described above.

T5 (6) Critical component investigation and testing.

(a) The objective of critical component investigation and testing is to provide for early identification of potential component quality problems and to provide for additional testing, special accumulation of performance data, and, as required, corrective action to prevent field failures of these components. Early cooperation between development, engineering, and quality assurance activities is essential for the conduct of this phase.

(b) Components, subassemblies, assemblies, or items will be identified during the development and early production phase of a system or major item when they have not been sufficiently tested; significantly affect performance; have a history of inferior quality; utilize new and unique engineering or production techniques; are inadequately documented; are commercial or proprietary in nature and have not been tested adequately in present application; or, in general, are considered suspect of quality problems.

(c) Items so identified will be investigated to determine the adequacy of the design. This investigation will include, if necessary, laboratory or proving ground tests, increased testing and inspection at production sites, surveillance over materiel in storage or use, and the application of accelerated storage or user tests.

(d) The conduct of critical item investigation will be in coordination with appropriate procurement, production, engineering, research, and maintenance agencies.

T6 (7) Confirmatory test.

(a) Confirmatory tests are not substitutes for tests described above. Generally, type I tests are limited to those characteristics not adequately demonstrated during the engineer/service tests and expected to be corrected prior to production.

(b) Type II confirmatory tests involve troops and therefore cannot be expected to provide information generated under controlled proving ground conditions, and usually results of such tests are not furnished early enough to be useful in controlling production. When such tests are required, consideration should be given to utilizing the opportunity for further verification of product quality.

e. Quality control operations

(1) General. The quality control system is made up of engineering, central administration, and inspection operation activities necessary to accomplish the process controls and inspection of prototype, regular production, and depot maintenance output to assure the delivery of products of specified quality standards. This includes all procedures, provisions, methods, and operations required in procurement and production to assure compliance with contract requirements. The three major functions of quality control are:

(a) Quality control engineering comprises the technical operations required for the development, control (including approval), and improvement of all procedures, provisions, standard instructions, and tools for process control, testing, and inspection of product during production, reconditioning, maintenance, or stockpile reliability operations. Quality engineering provides for the control of all inspection and testing procedures for assigned materiel. The technology for quality engineering includes statistical quality control, design of experiments, test and inspection equipment design, nondestructive testing methodology, and product quality technical analysis. Quality engineering provides technical assistance to other quality control operations.

(b) Quality control central administration comprises all the operations performed by the buying office in support of the quality control function. It includes preparing the final quality control data for contracting purposes, providing for inspection and test equipment, arranging for proving ground tests and laboratory services, instructions for the on-site inspection operations, performing the key inspection operation, and controlling nonconforming materiel.

(c) Inspection operations comprise all the inspection operations performed on-site at contractor facilities or at Government production operations to assure compliance with contract or work order requirements.

QCE1 (2) Support to development.

Provide quality control engineering services during development phase in direct support of the development operations. (Includes preparing quality assurance provisions and requirements, test methods and standards, process controls, workmanship standards, any requirements for on-site inspection of prototype materiel, and DA requirements for the development contract.) Assist in developing test plans and designs for test and inspection equipment. Provide special inspection instructions for procurement of ET/ST items and components.

QCE2 (3) Quality assurance provisions.

(a) Develop the necessary technical data required for the procurement and production phase of quality control. Includes:

1 Establishing required quality control standards and procedures for the product specifications and for subsidiary specifications.

2 Developing quality assurance provisions such as lotting criteria, sampling plans, quality properties, classification of characteristics, quality levels, tests, inspection methods, etc., for incorporation into specifications. Reviewing specifications to assure all parts contribute to required product quality.

3 Maintaining all quality engineering documentation for assigned product.

4 Providing supplemental quality assurance provisions as required.

5 Developing new and improved inspection methods, procedures, tests, sampling plans, etc., and providing for their application.

6 Developing special test plans as required for proving ground or laboratory testing of product and components, including sampling requirements for proof testing.

7 In cooperation with the development engineering element, continuing the reliability engineering effort necessary to support product engineering.

QCE3 (4) Design of inspection and test equipment.

In conjunction with quality control engineering (QE2), establish requirements for and prepare designs for necessary test and acceptance inspection equipment. Where designs are accomplished by the producer as a part of his quality control system, review and approve designs for use as quality standards by Govsrnment inspectors. When required, provide for the certification or acceptance of inspection equipment. Inspection and test equipment made available to users for operational and maintenance checkout of materiel will be consistent with that utilized in the acceptance of materiel in development and production.

QCE4 (5) Depot maintenance quality assurance provisions.

Quality control engineering to provide required quality asaurance proviaions for depot maintenance operations. This function is essentially similar to QE2 and QE3 above except it is for the maintenance operation. Appropriate planning early during the QE2 phase should provide a subatantial portion of the requirements for this phaae.

QCA1 (6) Quality control administration planning.

This phase of quality control provides for central planning for quality control in advance of procurement. It includes:

(a) Coordinating all quality assurance provisions for final preparation of the procurement data package; serving as the QA member of the contracting officer's team; furnishing QA representation for the technical evaluation of proposals.

(b) Operating the Product Quality Evaluation Laboratory to provide pilot lot services, parts failure analysis, and referee testing services.

(c) Arranging for all Government services required to support QA during procurement, such as furnishing inspection equipment, proving ground testing, quality evaluation laboratory services, certification of inspection equipment, and any other technical services required from the command.

(d) Designating a key inspector for the product.

(e) Providing for new item technical indoctrination of on-site inspection personnel as required.

(f) Preparing special QA letters of instruction to on-site inspection operations when required.

(g) Establishing workmanship standards for on-site Government inspectors and contractors when required.

(h) Conducting or arranging for subassembly or parts qualification.

QCA2 (7) Quality control administration.

This phase of quality control covers operations involving coordinated effort between central QA agency and the on-site operations. All of the production QC efforts of contractor activities require careful and timely coordination with the Government on-site inspection activities. The key inspector is essentially responsible for carrying out this coordination, and his effort will be planned to provide for maximum attention on those items that are new, difficult to produce, or on which experience indicates such action is desirable. Key inspection operations are product-oriented and will be directed to provide assistance to the on-site operations, quick reaction to potential problems, and assure adequate and uniform inspection. Priority will be given to key inspection operations during the initial phases of the contract to cover preaward surveys (when necessary), initial QA conference with Government inspection activities and with contractors, and a review of an early production item. Subsequent visits will be scheduled as required (AMCR 742-1).

QCA3 (8) Inspection operations.

This operation covers inspection element operations performed at production sites. It includes evaluation of contractor quality or inspection systems, inspection of product to contract requirements, and the acceptance of product. AMCR 715-508 and AMCR 715-509 cover this phase.

QCA4 (9) Control of nonconforming materiel.

The inspection element is responsible for accepting a product that conforms to contract requirements, exercising adequate review of contractor's quality or inspection system for the prevention of nonconforming materiel, and when appropriate, the evaluation and disposition of nonconforming materiel in accordance with the instructions of the command procuring offices. All requests for acceptance of nonconforming materiel which are beyond the limit specified by the command procuring activities will be submitted to that activity for technical review and disposition instructions. (See AMCR 715-55.)

QCA5 (10) Installation inspection.

Whenever installation of equipment at field sites is required by contract, arrangements will be made for adequate Government inspection of such on-site operations. Procedures in AMCR 715-508 and 715-509 will be used.

QCA6 (11) Quality control administration planning for depot reconditioning.

The appropriate commodity command QA element will provide planning similar to planning listed in QCA1 to cover reconditioning inspection at either contractor or Government activities as required. Key inspection operations for reconditioning will be conducted as prescribed above for production.

QCA7 (12) Inspection activities of depot maintenance.

Whenever depot level maintenance is accomplished by a contractor at his facilities, the procedures of AMCR 715-508 and AMCR 715-509 are applicable. When such maintenance is accomplished at a depot, the procedures of SMCR 742-30 are applicable. Product quality standards and specific quality assurance provisions will be covered by the technical requirements of the contract or order.

f. Stockpile reliability operations.

(1) General. The stockpile reliability phase required continuing determination of the stockpile to provide estimates of the effectiveness of the materiel in the stockpile, and where unsatisfactory conditions are disclosed, to provide a sound basis for corrective action. This generally includes an analysis and evaluation of user results in use and test, a laboratory testing program to bring back samples

of the material for periodic tests, and, in some cases, controlled functional tests of the product at proving grounds, insofar as possible duplicating the conditions of intended use for the product. Performance and usage data generated will be measured against the performance at the time of manufacture to predict the remaining usable life of stockpile items or their components. In addition, these data provide additional knowledge which can be utilized to improve new designs, revise technical data, and generally improve the quality of the product. Regardless of the type of commodity, the basic objective of the stockpile reliability phase is the same: to evaluate the condition of the stockpile, initiate any required corrective action, and supply the user only with a product that meets his quality requirements. However, the execution of the program will vary based on such factors as (1) one-shot devices vs. long-life products, (2) risks associated with materiel usage, (3) prior knowledge of deterioration rates, (4) cost of product, and (5) requirements from higher authority. Consequently, each command and project manager will develop a specific program for assigned materiel. Evaluation of end-items in storage as well as separately stocked components is required for a balanced stockpile program.

S1 (2) Stockpile reliability provisions and administration.

(a) Technical instructions required to support the stockpile reliability operation will be prepared and maintained as a part of quality control engineering and will normally be accomplished during the reliability and quality engineering activities previously described. These stockpile reliability provisions will contain all the technical data, such as quality standards, inspection and test equipment requirements, sampling plans, laboratory instructions, and storage activities inspection instructions required for the conduct of the operations. The administration of the stockpile reliability operation includes:

1 Arranging for necessary laboratory and proving ground testing facilities and services.

2 Providing for procurement of additional quantities of product and components when the testing program is destructive.

3 Scheduling laboratory and proving ground test programs and arranging for selection and return of product for testing.

4 Providing for storage installation inspection of stockpile when required.

5 Performing analyses of stockpile reliability data and preparing and submitting evaluation reports. Final decisions to modify or in any way change materiel in stockpile are the responsibility of engineering and maintenance activities; therefore, recommendations in reports must be prepared in such a manner as to allow expeditious corrective action by the responsible agents.

S2 (3) Storage inspection.

Storage inspection covers periodic inspections performed by the storage activities in accordance with the stockpile reliability provisions plan.

S3 (4) Laboratory testing.

In addition to the stockpile reliability testing, special tests (see T5) will be conducted as required by the plan.

g. Calibration operations.

(1) General. The metrology program is designed to achieve and maintain the required accuracy for all measurements performed in support of the product throughout its life cycle. All efforts in this area will be performad by the commodity commands in conjunction with or by the Army Metrology and Calibration Center, as appropriate, and as specified in AMCR 700-9.

M0 (2) Provide information and assistance to USACDC concerning practicable calibration structures, current levels af accuracy achievable in various parameters, and possible improvements in precision or accuracy through planned development of new measurement standards or measuring and test equipment.

M1 (3) Review those draft QMR's and SDR's involving metrology and calibration items such as measuring and test equipment, measurement standards, accessory equipment, or facilities.

M2 (4) During the project definition phase, if applicable, determine whether it is feasible to support the new weapon system with either existing metrology and calibration services and equipment or those expected as a result of concurrent developments.

M3 (5) Metrology engineering during the development phase includes:

(a) Providing information on currently achievable measurement accuracies, measurement techniques, and available measurement equipment.

(b) Analysis and forecast of all materiel development projects or contracts to insure early identification of new measurement parameters or accuracy requirements that may require development of new measuring and test equipment, measurement standards, or measurement techniques.

(c) Preliminary design of test and measuring equipment for engineering, production, and maintenance support.

(d) Establishing development projects for new measuring and test equipment or measurement standards required for calibration purposes. These projects must run concurrently with the weapon system development.

(e) Forecasting requirements for calibration of the end item, its components, or its related test and measuring equipment. Based on these requirements, initiate planning for necessary metrology facilities, i.e., new or enlarged calibration laboratories, enlarged calibration team capabilities, new measurement standards, etc.

M4

(6) Establish and document a calibration structure for the weapon system. This is comprised of measurement standards that are used by calibration teams to calibrate the basic measuring and test equipment used directly on the system, the secondary standards that are used by an Army calibration laboratory to calibrate the team's standards, and the primary standards in the Army Standards Laboratory that are used to calibrate the secondary standards. Select from existing measurement standards those that conform to the requirements expressed in the structure. Initiate design of new or modified measurement standards required to complete the structure. Initiate preparation of calibration procedures for the item, its associated measuring and test equipment, and the measurement standards required in the calibration structure. Assure coverage of calibration system requirements for all development, production, and overhaul contracts by the inclusion of MIL-C-45662. Assess producers' conformance to provisions of the specification or contract. Provide calibration support for the measuring and test equipment supplied to the quality assurance representative for his sole use in acceptance. Provide requirements

for training of civilian and military personnel in measurement skills and calibration techniques needed to utilize new equipment.

M5 (7) Initiate procurement of prototype measurement standards concurrently with procurement of prototype measuring and test equipment. Conduct dynamic evaluation of calibration procedures, measurement standards, and measuring and test equipment.

M6 (8) On the basis of available deployment data, provision the complete calibration structure down to the user level, including all required facilities, measuring and test equipment, and measurement standards.

M7 (9) Accumulate data from users on equipment performance, calibration intervals, etc. Revise equipment specifications and calibration procedures to reflect this field experience.

M8 (10) Dispose of or redeploy equipment made available by obsolescence or modification of a system or portions of a system.

b. Breakout and repair parts procurement operations.

(1) General. Quality control operations for breakout and repair parts procurement must be planned and executed in essentially similar fashion as the program described for the major system. In order to provide an effective quality control program for repair parts and breakout procurements, each command will establish appropriate operations devoted to breakout and repair parts quality control apart from major system programs. A part of this separate program will be a schedule of priorities for the quality control engineers and key inspectors so that available resources can be appropriately allocated to critical items or high cost procurements where risks are large. Efforts should be directed to operations that prevent poor quality from being produced and delivered.

B1 (2) Quality control engineering. The basic policies and techniques described for the quality control engineering of major systems are also applicable to breakout and repair parts quality control engineering. Maximum effort should be made during the early quality control engineering efforts of the major system to identify breakout and repair parts and require preparation of adequate quality assurance provisions and inspection equipment designs for these items. Where adequate documentation and equipment exist, quality control

engineering during this phase consists of a thorough review and any necessary updating. Approved deviations, change orders, procurement quality history, and performance quality history will be considered during this review. If documentation and equipment are not adequate or do not exist, they will be revised or prepared in accordance with the policies and procedures already described for the major system.

B2 (3) Command planning and control. Appropriate elements of the command will be designated to perform necessary planning and control of repair parts procurements. Planning will include final preparation of quality assurance requirements for the RFP or IFB, arranging for Government laboratory services, providing inspection equipment, making available technical specialists to assist on-site inspectors, and arranging for new item indoctrination of on-site inspectors. The quality control administration element will also be responsible for the following:

(a) Providing special instructions for the field pre-award survey when required, or in special situations participating in the technical review of prospective producers.

(b) Participating in the evaluation of quality control aspects of proposals and serving as the quality control member of the contracting officer's team.

(c) Providing a special quality assurance letter of instruction to on-site inspectors whenever peculiar requirements exist.

(d) Arranging for an initial quality assurance conference with on-site Government inspectors and later with contractors to assure that all activities clearly understand all requirements. These conferences must be carefully planned and executed. Before any meeting with contractor personnel, the command on-site inspection staff must have agreement.

(e) Key inspection visits should be carefully scheduled, giving priority to initial visits during initial production phases. These early visits are for the purpose of discovering any potential quality problem area in sufficient time to allow for correction and prevent production of unsatisfactory products. Discovery of any potential engineering or procurement type problem can be quickly brought

to the attention of the appropriate command element for solution.

(f) Additional periodic key inspection visits as required.

(g) Special attention will be made to assure that other than prime manufacturer parts (under performance specification procurement) do not degrade the materiel design and that parts will meet user needs.

(Note: In addition to the above planning and control activities a special test program will normally be conducted. Every product of military design will be subject to a first article or pilot laboratory test. These tests will be preferably conducted at a Government facility experienced with the product. If these tests are conducted at the contractor's facilities, the command quality control staff will be responsible for the inspection and final approvals. Before the conduct of these tests, the contractor and on-site Government inspectors will complete all of their tests and inspections. A product that does not comply with all existing requirements should not be offered for first article inspection. A special receiving depot inspection may also be conducted for critical items or for producers with a history of poor quality. The quality control administration element will be responsible for all arrangements with the depots. Also, a periodic sampling of product from industry by the depot will be scheduled to determine the overall quality of product entering the system)

BY (4) On-site inspection. On-site inspection activities will be conducted as prescribed in AMCR's 715-508 and 715-509. Control of nonconforming materiel is the responsibility of the command and will be in accordance with AMCR 715-55.

i. Technical data quality control operations.

(1) General. Every activity responsible for the development and preparation of technical documentation such as drawings, specifications, descriptions of manufacture, technical manuals, and other publications is responsible for their quality and will establish a formal system for controlling their quality. This system will include appropriate requirements for inclusion in contracts when such documentation is procured, and for a system of verifying the quality of the product. Verification will as a minimum provide for a technical review and an editorial

review. The technical review will be for the completeness and adequacy of the technical content of the documentation for its intended use. The editorial review will be for the correctness of format, composition of text, writing style, and adherence to standards of workmanship. The documentation quality control plan will provide for adequate statements of quality requirements and for schedule of delivery of the documentation.

(2) Individual responsibility for the adequacy of the documentation will be stressed. In addition, a process control system will be employed to independently evaluate the documentation quality and to provide periodic reports of level of documentation quality.

j. Depot maintenance quality control system.

This section covers all the elements of a depot maintenance quality control system in one place and on one chart to show the extent of the system and relationship between the elements. These elements appear in previous charts to show how they relate to other portions of the quality assurance system. For example, the quality assurance provision and equipment engineering are on the general quality control engineering chart where it is related to the quality control engineering for production and procurement. The basic engineering technology is the same and generally the same engineering group will accomplish the engineering for both production and overhaul programs. Testing is also shown on the test chart and covered in the test section in order that the standards for the test of reconditioned materiel and the conduct of the test be essentially the same as the engineering test and subsequent production tests. Quality control administration and on-site inspection have also been covered. When depot maintenance is accomplished by a Government depot, process quality control becomes of major concern for the quality of the product and the overall costs of the operation are influenced by the process control techniques employed. Each maintenance activity is responsible for establishing adequate process control procedures and equipment as a part of the total production system for the proper and economic production of required product at the expected quality levels. Developing these process controls is the responsibility of the depot; however, the commands can and should provide assistance based on their experiences with production activities, both contract producers of the equipment and depots or contractors engaged in the reconditioning of the item.

k. Maintainability engineering.

AO (1) Maintainability improvement. Maintainability engineering, to be effective, must retain capability in the maintain-

ability technology as it applies to assigned commodities. This is accomplished by a sustaining effort involving identification of problem areas and the application of this knowledge to future operations; establishing experience files to assist in future development efforts; devising methodology for evaluating or predicting performance; and developing special techniques such as check lists, contract clauses, and standards that may be used for future projects. Assistance is furnished to engineering, USACDC, and other customers in establishing maintainability requirements and methods for demonstrating maintainability. This effort should be associated with reliability improvement.

A1 (2) QMR/SDR maintainability improvement. During this phase, the QMR or SDR drafts are reviewed to provide for realistic maintainability requirement statements which are compatible with all other stated product characteristics. Maintainability requirements must be obtainable and capable of being demonstrated by a reasonable test program. Maintainability requirements should be stated in quantitative terms with an associated level of confidence whenever possible. A general statement on method of demonstrating maintainability under controlled conditions should be included. (See AR 705-26.)

A2 (3) Project maintainability engineering. As soon as possible after receipt of the approved project, the maintainability engineering effort provides for refining the general requirements in the QMR's into technical requirements that can be used in development contracts or Government laboratories. These statements are a part of the technical characteristics describing the project. Maintainability requirements will be prepared to be included in the contract for the Project Definition Phase, if applicable, and for the development contracts. This will include developing specific quantitative maintainability requirements for the system and subsystems; preparing detail scopes of work for maintainability effort where required; selecting specific specifications for inclusion in contracts; and specifying test plans to demonstrate achieved maintainability. This includes the preparation of the appropriate parts of the Technical Development Plan covering maintainability. Maintainability effort during development requires maintainability engineering participation with development engineering to provide for:

(a) Continued analysis of design efforts to provide for appropriate maintainability considerations necessary to achieve required inherent maintainability and to

assure proper considerations of maintainability during design trade-off decisions.

(b) Establish a maintainability test plan in conjunction with the reliability test plan to demonstrate maintainability levels.

(c) Prepare necessary documentation to support maintainability programs such as contract provisions, scopes of work, specifications, standards, and reports. Provide maintainability guidelines and desired maintainability practices for designers.

(d) Provide for field data experience to system design activities.

(e) Provide for an educational program directed to the specific project personnel for the individual understanding of maintainability requirements and the individual's contribution to maintainability.

A3 (4) Assistance and analysis effort. During development the maintenance engineer staff of the national maintenance points will assist the design engineers to achieve the desired levels of maintainability. In addition to assistance these maintenance engineering activities will periodically analyze the designs, components,and end item to assure that required maintenance criteria and maintainability levels are achieved.

A4 (5) Maintenance support plan. The maintenance support plan will be developed in conjunction with the maintainability program to provide a complete package compatible with the specific product. This plan will be in accordance with existing regulations concerning those actions required to provide the maintenance materials, repair parts, tools, and equipment, and development of maintenance.procedures.

A5 (6) Product review. Arrangements will be made for providing ample opportunity for the maintenance engineers of the national maintenance point to examine the product and to determine the adequacy of the maintenance package. These reviews should be accomplished on an early model, a prototype item, and one from early production. These reviews are not substitutes for the testing to be performed by USATECOM.

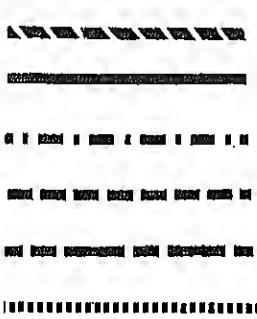
(7) Maintenance technicians. Full use will be made of the maintenance technician during early phases of the product introduction to the user.

Appendix III

PRODUCT LIFE CYCLE

- THE CHARTS IN THIS APPENDIX ARE KEYED TO THE MASTER NETWORK.

THE FOLLOWING KEY INDICATES THE PHASE IN THE PRODUCT LIFE CYCLE WHERE THESE ACTIONS TAKE PLACE.

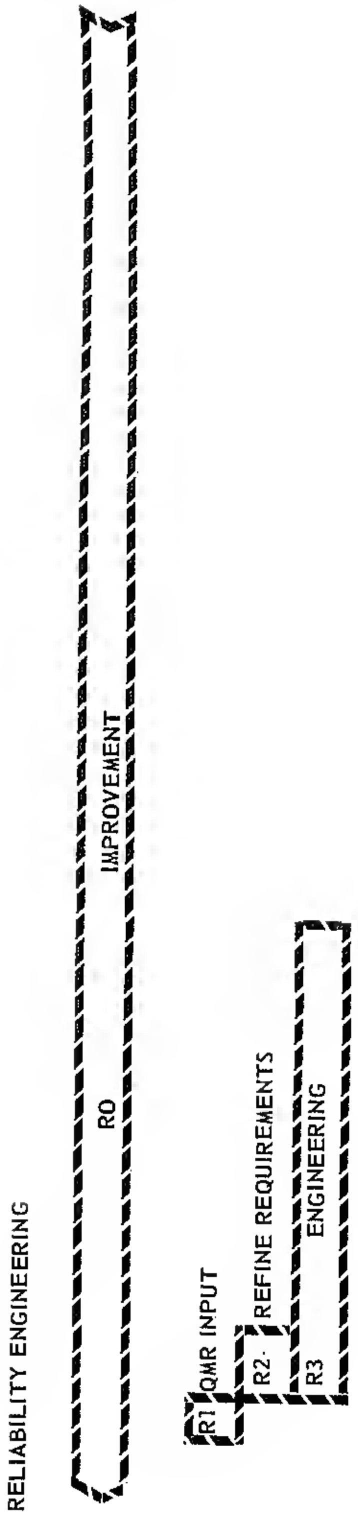


PRODUCT LIFE CYCLE

SOURCES

a) AMCR 11-16
b) MAJOR ACTIVITIES FOR SYSTEM MGT
c) AFSCM 375-1

Chart A


RELIABILITY ENGINEERING
R0 IMPROVEMENT
R1 QMR INPUT
R2 REFINE REQUIREMENTS
R3 ENGINEERING

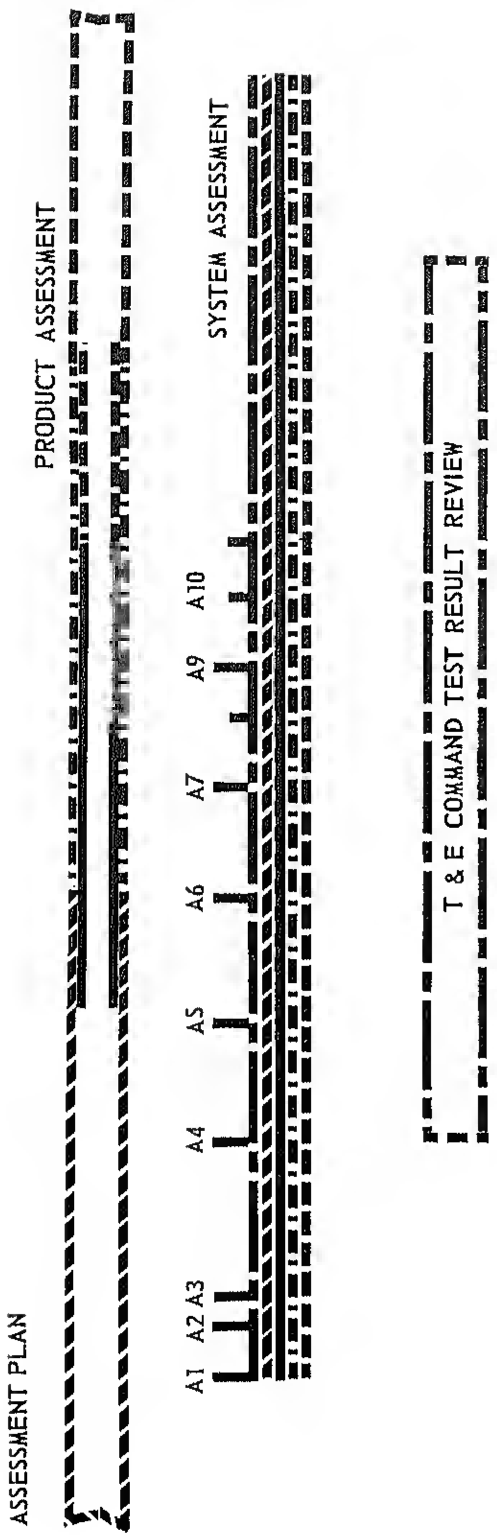
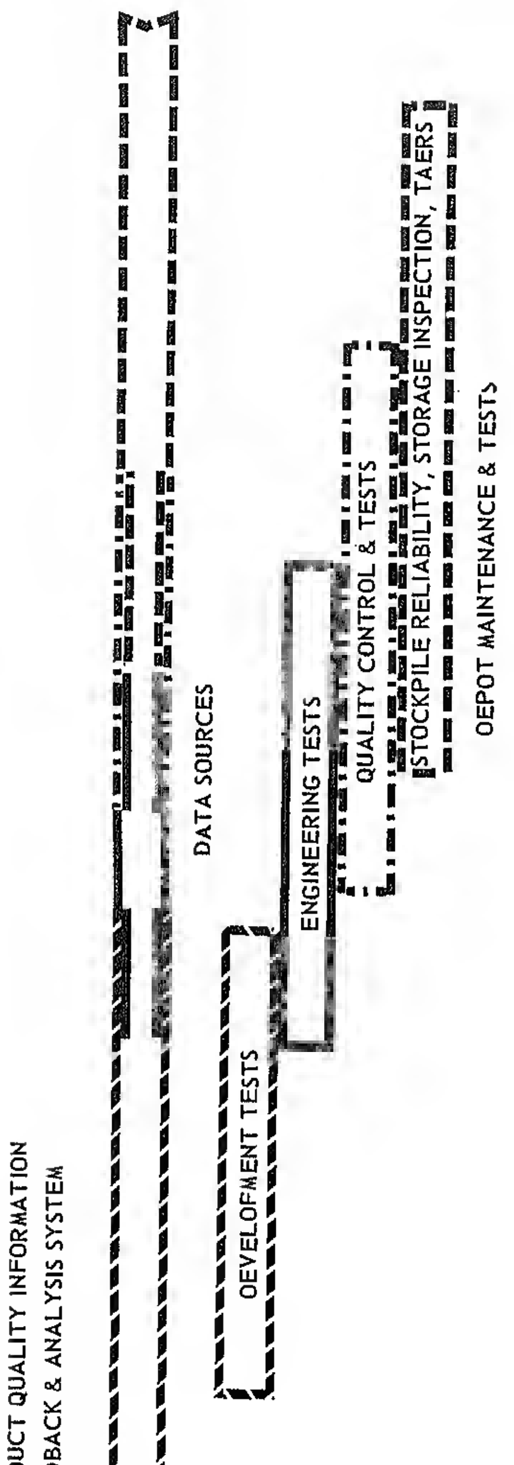
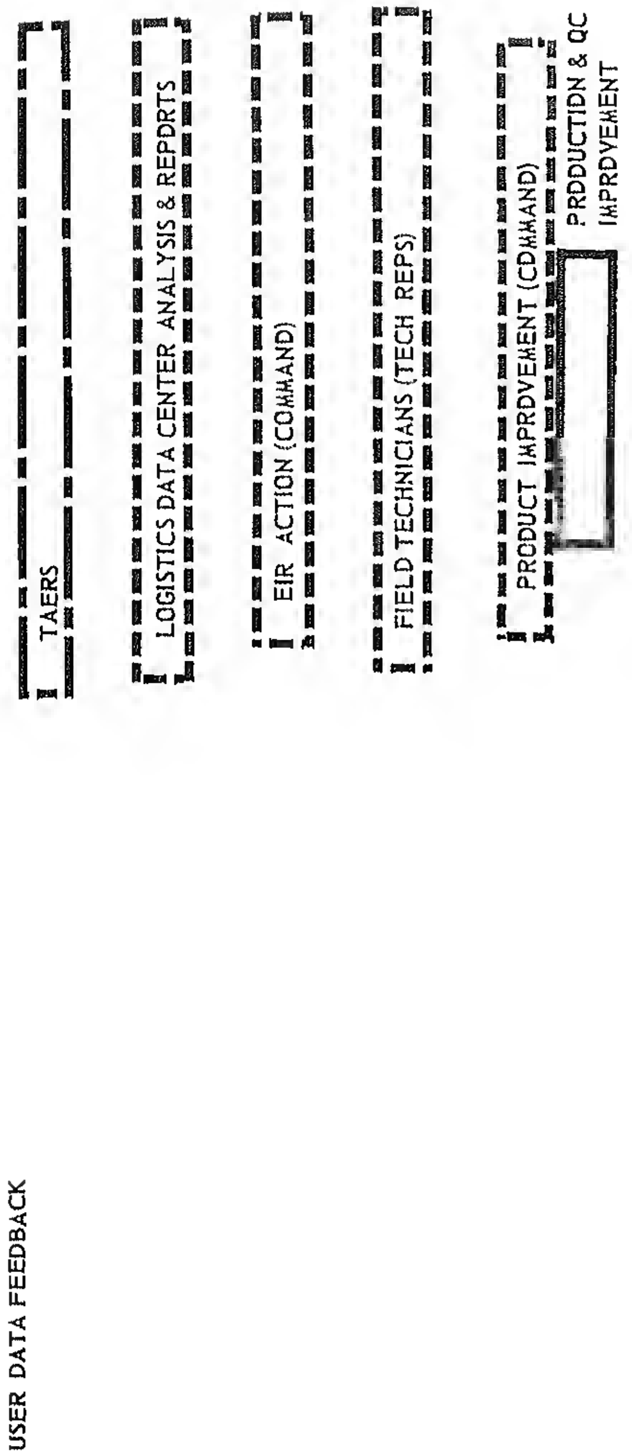
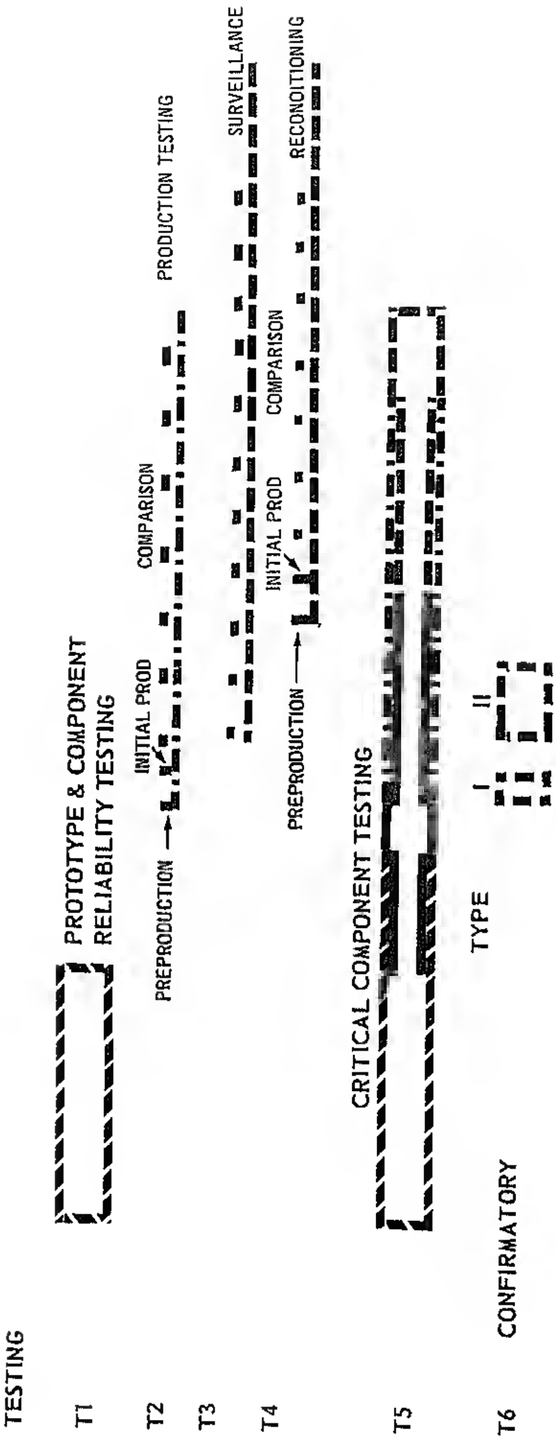
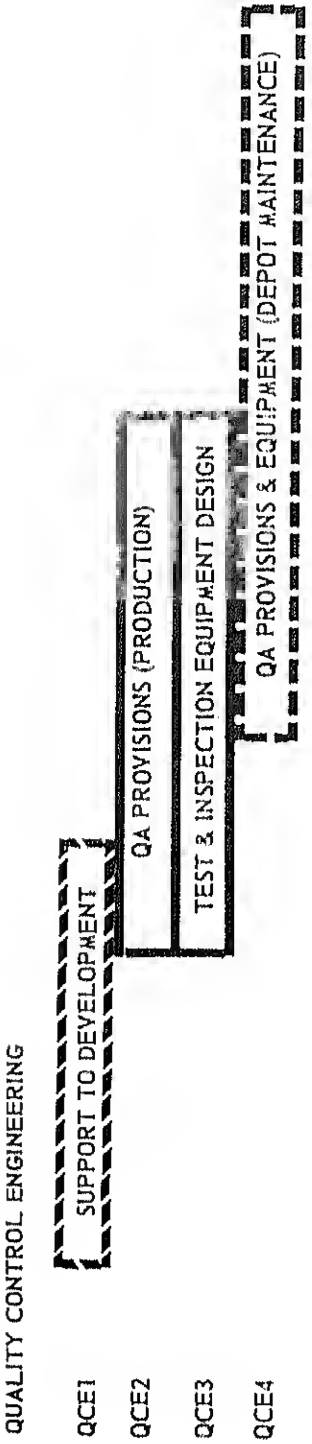

ASSESSMENT PLAN
PRODUCT ASSESSMENT
A1 A2 A3 A4 A5 A6 A7 A9 A10
SYSTEM ASSESSMENT
T & E COMMAND TEST RESULT REVIEW

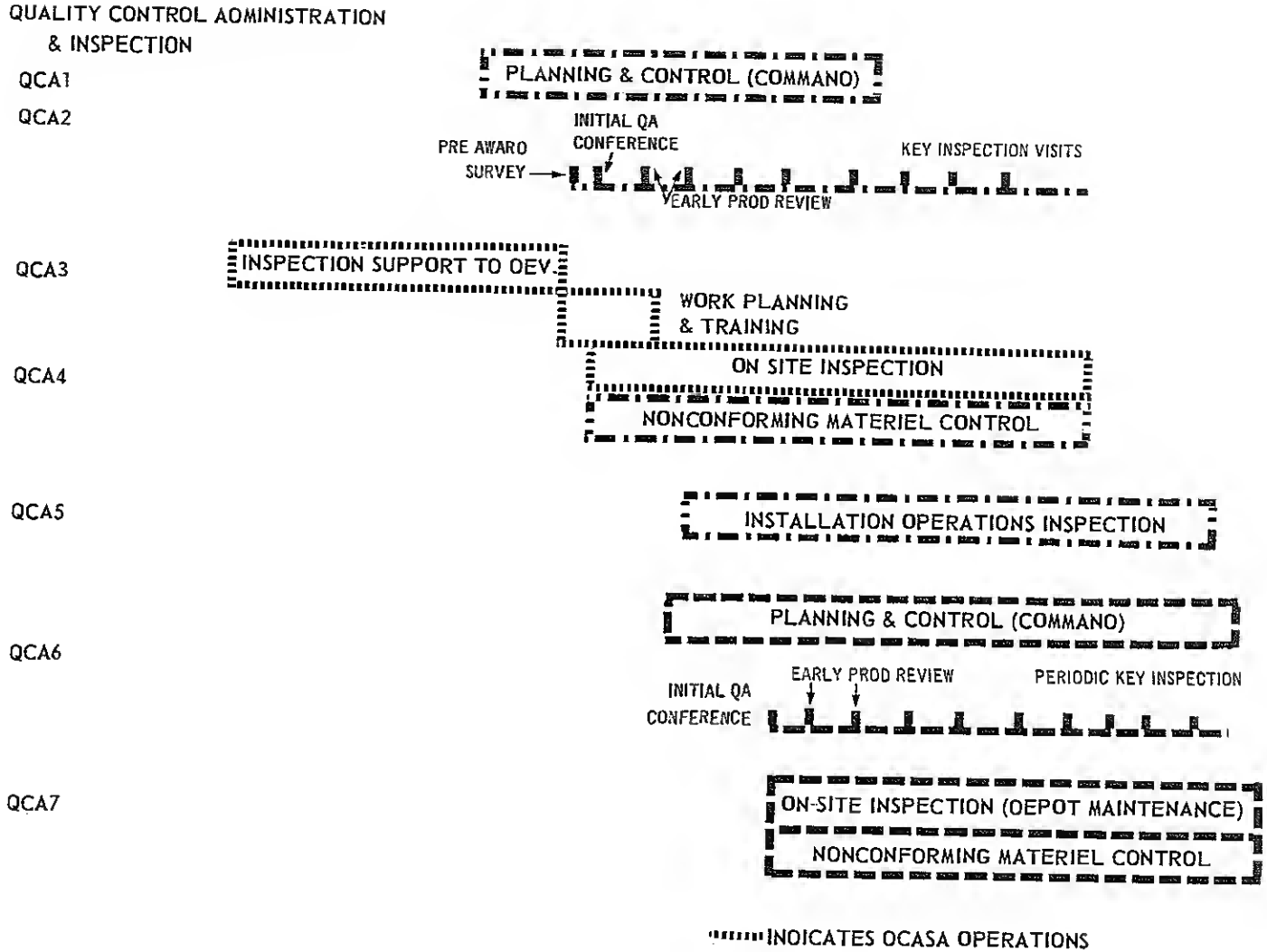
Chart C


PRODUCT QUALITY INFORMATION
FEEDBACK & ANALYSIS SYSTEM
DATA SOURCES
DEVELOPMENT TESTS
ENGINEERING TESTS
QUALITY CONTROL & TESTS
STOCKPILE RELIABILITY, STORAGE INSPECTION, TAERS
DEPOT MAINTENANCE & TESTS


USER DATA FEEDBACK
TAERS
LOGISTICS DATA CENTER ANALYSIS & REPORTS
EIR ACTION (COMMAND)
FIELD TECHNICIANS (TECH REPS)
PRODUCT IMPROVEMENT (COMMAND)
PRODUCTION & QC IMPROVEMENT


TESTING
T1
PROTOTYPE & COMPONENT RELIABILITY TESTING
T2
PREPRODUCTION
INITIAL PROD
COMPARISON
PRODUCTION TESTING
T3
SURVEILLANCE
T4
PREPRODUCTION
INITIAL PROD
COMPARISON
RECONDITIONING
T5
CRITICAL COMPONENT TESTING
T6
CONFIRMATORY
TYPE
I
II


QUALITY CONTROL ENGINEERING
QCE1
SUPPORT TO DEVELOPMENT
QCE2
QA PROVISIONS (PRODUCTION)
QCE3
TEST & INSPECTION EQUIPMENT DESIGN
QCE4
QA PROVISIONS & EQUIPMENT (DEPOT MAINTENANCE)


QUALITY CONTROL AOMINISTRATION
& INSPECTION
QCA1
PLANNING & CONTROL (COMMANO)
QCA2
INITIAL QA
CONFERENCE
PRE AWARO
SURVEY
KEY INSPECTION VISITS
EARLY PROD REVIEW
QCA3
INSPECTION SUPPORT TO OEV
WORK PLANNING
& TRAINING
QCA4
ON SITE INSPECTION
NONCONFORMING MATERIEL CONTROL
QCA5
INSTALLATION OPERATIONS INSPECTION
QCA6
PLANNING & CONTROL (COMMANO)
EARLY PROD REVIEW
PERIODIC KEY INSPECTION
INITIAL QA
CONFERENCE
QCA7
ON-SITE INSPECTION (OEPOT MAINTENANCE)
NONCONFORMING MATERIEL CONTROL
INOICATES OCASA OPERATIONS

STOCKPILE RELIABILITY

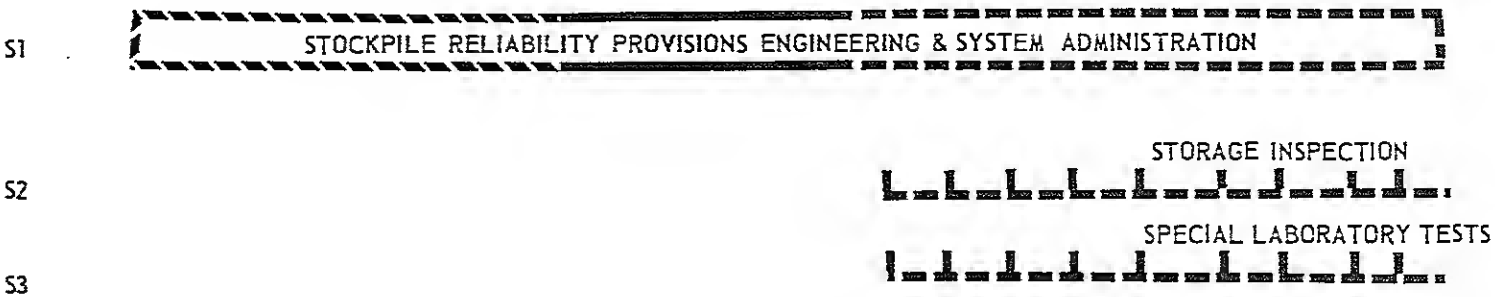
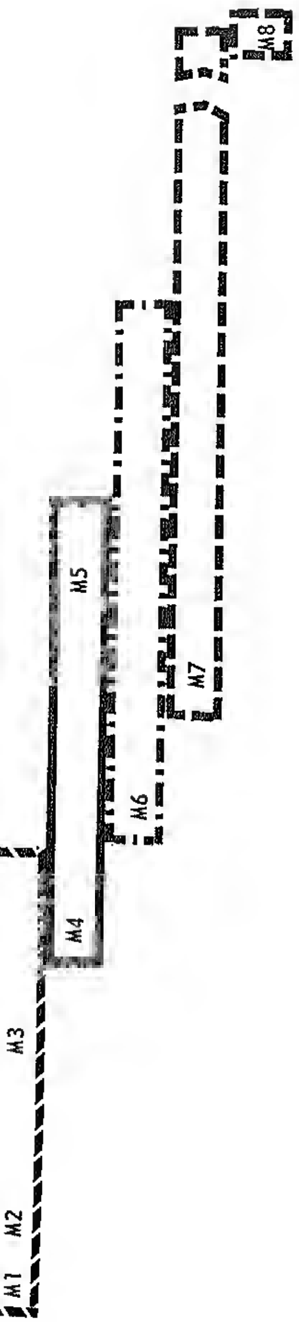


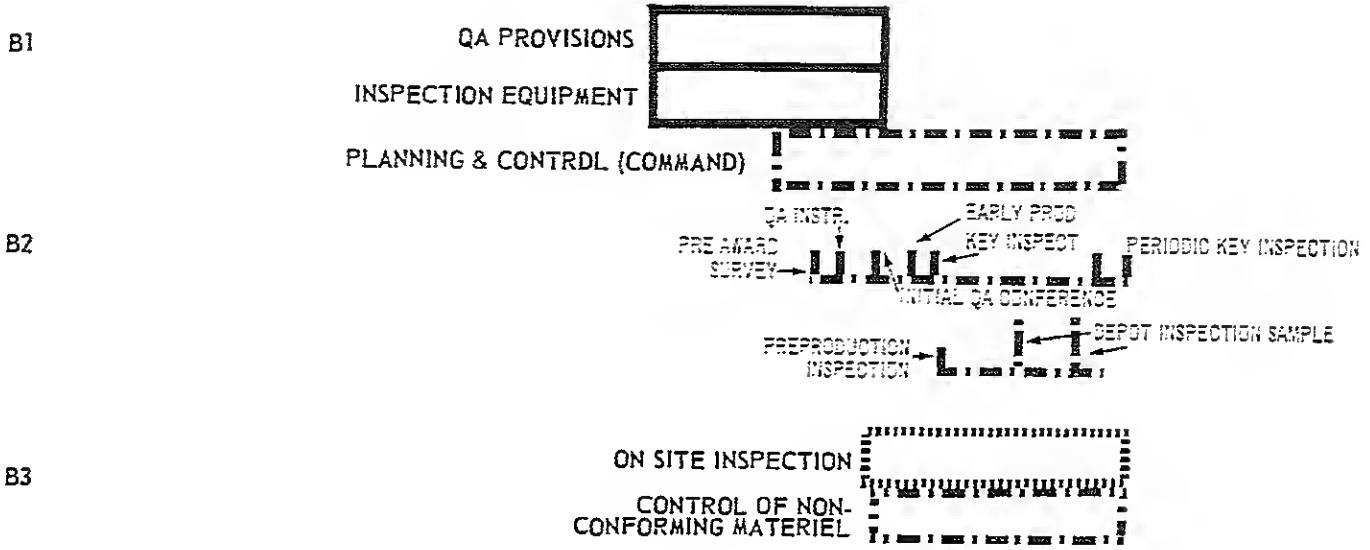
Chart F

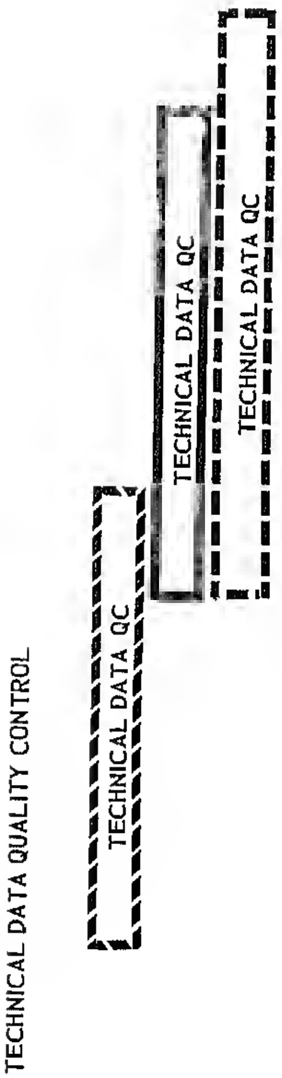
AMCR 700-6



BREAKOUT & REPAIR PARTS PROCUREMENT

BREAKOUT & REPAIR PARTS PROCUREMENT




TECHNICAL DATA QUALITY CONTROL
TECHNICAL DATA QC
TECHNICAL DATA QC
TECHNICAL DATA QC

DEPOT MAINTENANCE Q.C. SYSTEM

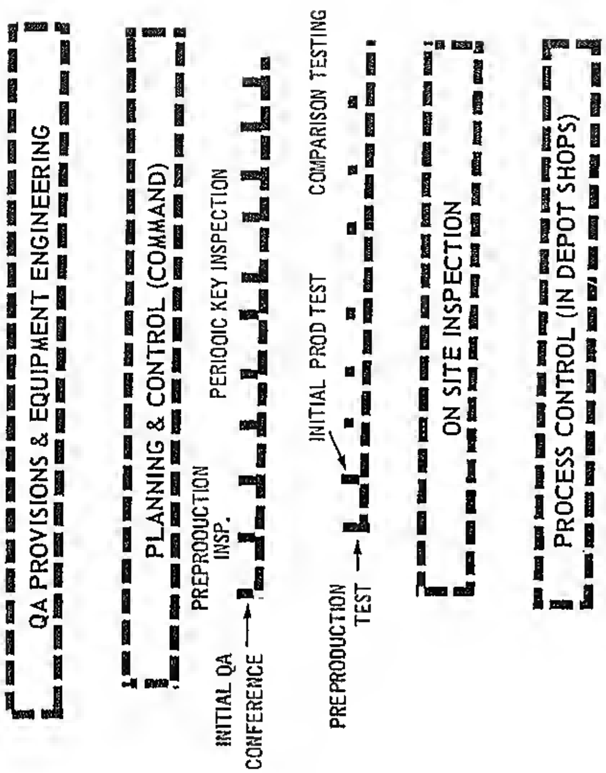
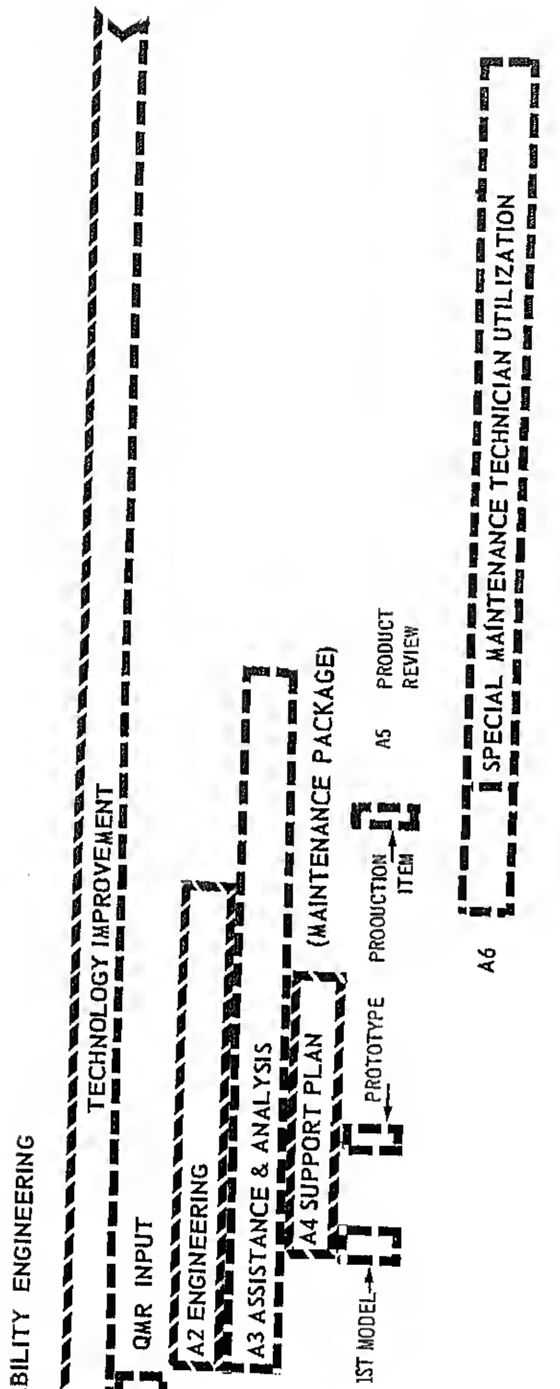


Chart K


MAINTAINABILITY ENGINEERING
A0
TECHNOLOGY IMPROVEMENT
A1
QMR INPUT
A2 ENGINEERING
A3 ASSISTANCE & ANALYSIS
A4 SUPPORT PLAN
(MAINTENANCE PACKAGE)
1ST MODEL
PROTOTYPE
PRODUCTION ITEM
A5
PRODUCT REVIEW
A6
SPECIAL MAINTENANCE TECHNICIAN UTILIZATION

(AMCQA)

FOR THE COMMANDER:

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Chief of Staff

OFFICIAL:

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Asst Chief, Administrative Office

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